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(54) Glass melting

(57) A glass melting tank 12 with submerged electrodes 15 has a feed system comprising a hopper 23 mounted on a carriage 20. The hopper 23 supplies batch material onto a horizontal conveyor 26 which reciprocates along its length over the melting zone. The carrier 20 and conveyor 26 reciprocate along rails 21 and 22 at a speed which varies so as to slow the speed of movement adjacent each row of electrodes so as to deposit a greater quantity of batch material adjacent the electrodes.

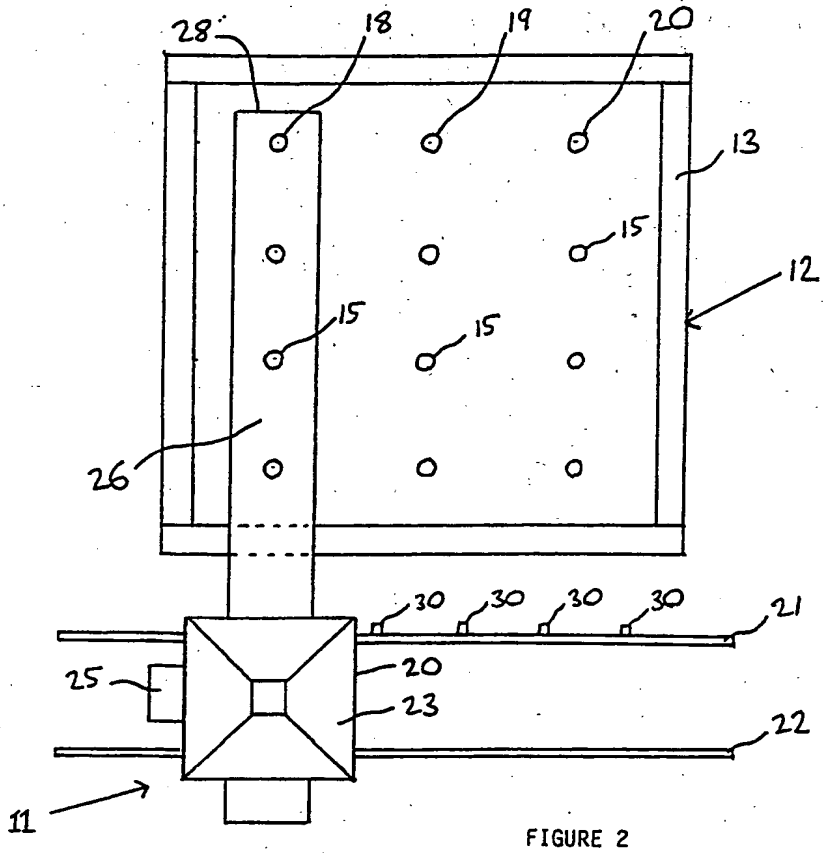

FIGURE 2

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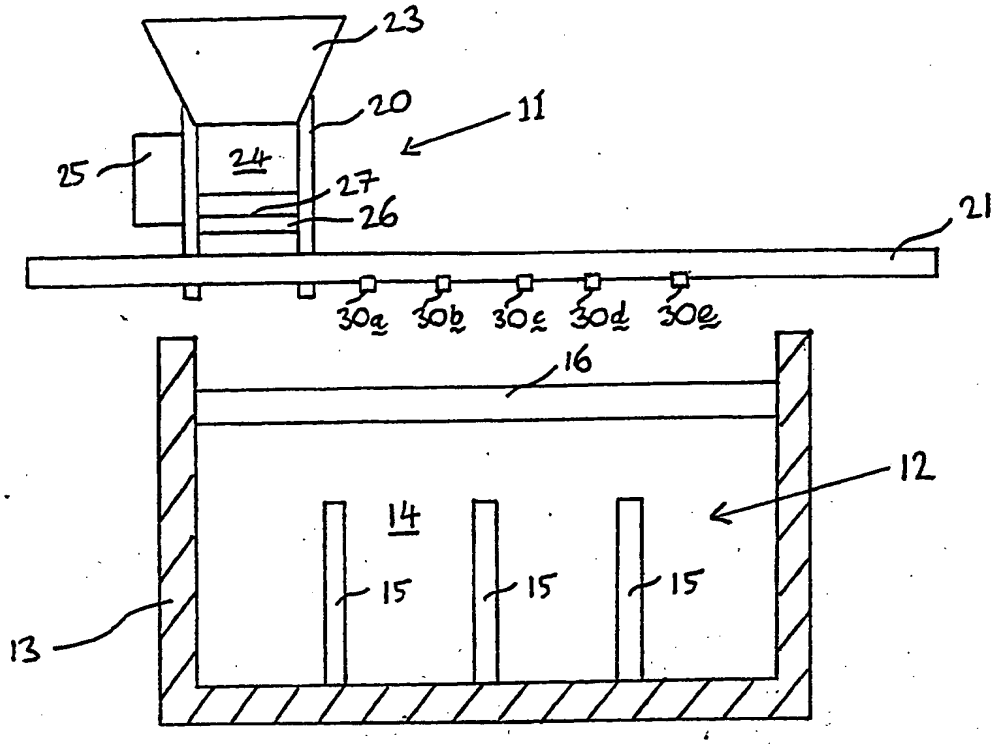

FIGURE 1

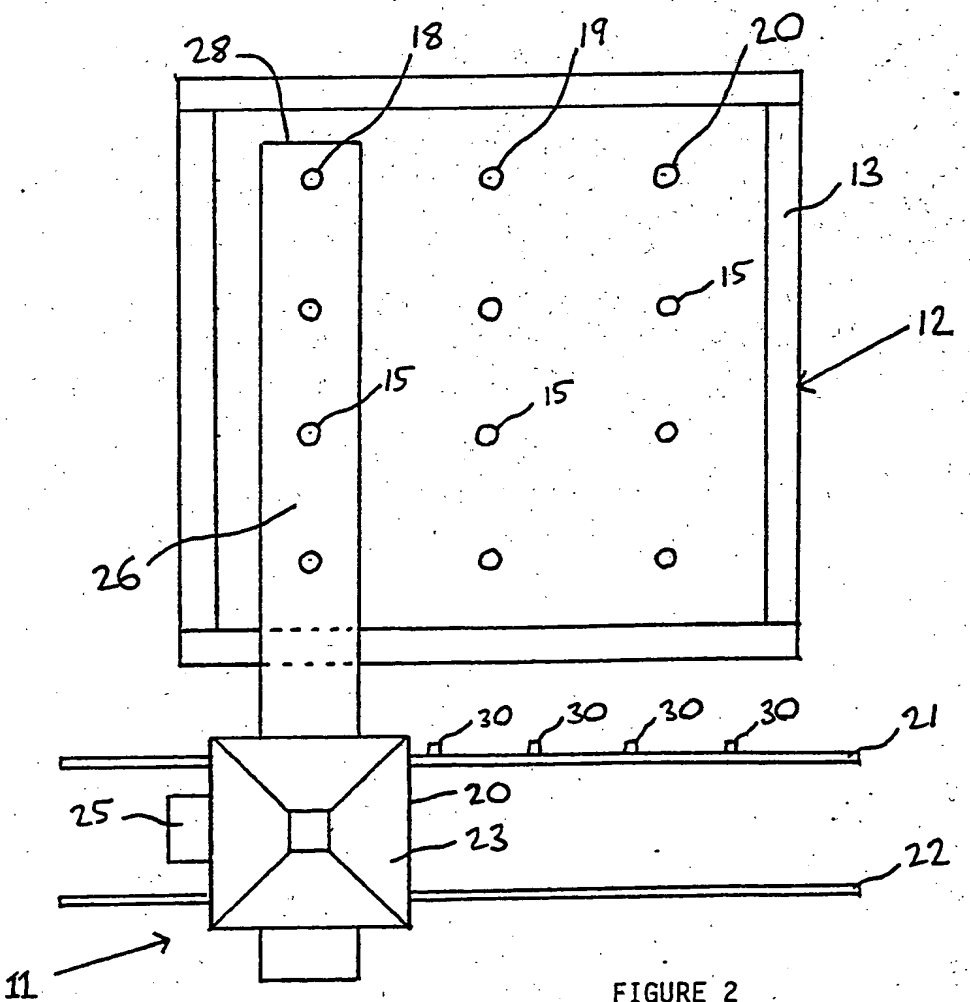

FIGURE 2

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GLASS MELTING

The invention relates to glass melting tanks and more particularly to a feed system for feeding batch material onto the melting zone of a glass melting tank.

Cold top glass melters are known in which molten glass is heated by means of vertical or horizontal electrodes immersed in the molten glass and the whole of the melt surface is covered by a layer of unmelted batch material. The batch material is continuously melted by heat from the electrodes and it is necessary to replenish the layer of unmelted batch by a feed system depositing batch material onto the top surface of the unmelted layer of batch.

If new batch material is deposited uniformly over the area of the blanket of unmelted batch and the melt rate of the batch from the underside of the blanket is uniform then the blanket should remain of uniform thickness with the avoidance of holes occurring in the blanket. However, under some conditions which may depend on batch composition and furnace load, hot spots can develop over the electrodes causing holes with no batch cover over some electrode positions and the possibility of blanket thickening between the electrodes.

It is an object of the present invention to provide an improved feed system for feeding batch material to a melting zone of a glass melting tank having submerged electrodes in which breaks in the blanket cover are avoided.

In particular a preferred embodiment of the invention provides a driven feed system which is controlled so that more batch material is deposited over rows of electrodes and less between the electrodes where the blanket may be thicker.

Broadly according to the present invention there is provided a feed system for feeding batch material to a melting zone of a glass melting tank having submerged electrodes to heat the glass in the melting zone, which feed system comprises a batch distributor device arranged to move relatively to the melting zone to discharge batch over the surface of glass in the melting zone and control means to control movement of the batch distributor device so as to deposit a greater quantity of batch material adjacent said electrodes than over other areas. Preferably the control means is arranged to control the speed of movement of the batch distributor device in predeterined directions.

The present invention more particularly provides a feed system for feeding batch material to a melting zone of a glass melting tank having rows of submerged electrodes to heat the glass in the melting zone, which feed system comprises a mobile carriage arranged for reciprocating movement in a first direction across said rows of electrodes, a batch distributer mounted on said carriage for reciprocating movement relative to the carriage in a second direction across said first direction, said batch distributer having a discharge outlet for mounting above a melting zone of a tank whereby batch material may be discharged at a substantially constant rate over the surface of glass in the melting zone, and a drive system for reciprocating the carriage in said first direction and the batch distributer in said second direction, said drive system having a speed control arranged to drive said carriage at a variable speed in at least said first direction so as to slow the speed of movement adjacent each row of electrodes in said tank so as to deposit a greater quantity of batch material adjacent said electrodes.

Preferably said mobile carriage is mounted on a guide track at a level above said glass melting tank, said track being provided with indicators at selected positions along its

length to indicate sections of the track where slower speed movement is required.

Preferably the batch distributer comprises a feed unit mounted over a feed conveyor with a batch conveying surface driven in one direction along its length, said conveyor being reciprocated along its length by said drive system and having a discharge end from which batch material may fall onto the surface of glass in the tank. Preferably the feed unit has a variable rate of feed system responsive to the drive system for reciprocating the conveyor so as to vary the feed rate onto the conveyor in dependence on the direction of reciprocation of the conveyor so as to provide a constant depth of batch material on said conveying surface.

Preferably said feed unit comprises a hopper coupled to a vibratory feeder.

The invention further provides a method of feeding batch material to a melting zone of a glass melting tank having submerged electrodes to heat the glass in the melting zone comprising moving a batch distributor device relatively to the melting zone to discharge batch over the surface of glass in the melting zone and controlling movement of the batch distributor device so as to deposit a greater quantity of batch material adjacent said electrodes than over other areas. Preferably the method comprises controlling the speed of movement of the batch distributor device in predetermined directions.

A preferred example of the present invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a section through a glass melting tank having a feed system in accordance with the present invention, and

Figure 2 is a plan view of the arrangement shown in Figure 1.

In this example a batch feed system 11 for feeding batch material in granular form is mounted at a level above a cold top glass melting tank 12. The tank 12 has walls and a base formed of refractory material 13 and contains molten glass 14. Heat is applied to the molten glass by electrically operated electrodes 15 arranged in rows extending across the tank. The top of the molten glass is covered by a blanket 16 of unmelted batch material which has been fed onto the molten glass by the feed system 11. As can be seen from Figure 2, the electrodes 15 of this example form three parallel rows 18, 19 and 20.

The feed system 11 is mounted at a level above the surface of the glass melting tank 12 and comprises a mobile carriage 20 mounted on two horizontal parallel rails 21 and 22 extending parallel with one side of the tank 12 in a direction which crosses the rows of electrodes 18, 19 and 20. The carriage 20 has mounted on it a batch containing hopper 23 feeding material to a vibratory feeder 24 driven by a drive system 25. The feeder 24 is mounted directly above a horizontal conveyor 26 also mounted on the carriage 20. The conveyor 26 comprises an elongated conveyor having an upper surface 27 on which batch material is supported after supply from the feeder 24. The conveyor 26 extends horizontally over the surface of the blanket 16 in a direction parallel to each of the rows of electrodes. The surface 27 of the conveyor 26 is in the form of an endless loop and is driven in a constant direction by the drive system 25 so as to convey batch material from the feeder 24 to a discharge end 28 from which batch material falls off the conveyor onto the blanket 16. Although the closed loop conveyor surface is always driven in the same sense, the conveyor is reciprocated relative to the carriage 20 so that the discharge end 28 moves in a reciprocating direction along the direction of the rows of electrodes. In

addition to driving the reciprocating movement of the conveyor 26, the drive system 25 also drives the carriage 20 in a reciprocating movement along the support rails 21 and 22. In this way the conveyor 26 is reciprocated along the direction of the rows of electrodes and is moved along the rails 21 and 22 so as to be reciprocated across the width of the tank thereby traversing the direction of the rows of electrodes. This causes the discharge end 28 to move in a reciprocating path which covers all areas of the blanket 16 thereby depositing batch material onto the entire area of the blanket. The feed unit 24 has a variable feed rate driven by the drive system 25 so that the rate of supply of batch material from the feeder 24 onto the conveyor 26 is varied to take account of the relative movement of the conveying surface 27 past the feeder 24. It will be appreciated that in one direction of reciprocation of the conveyor 26 the movement is in the same direction as that of the normal travel of the conveying surface 27 but in the reverse direction of reciprocating movement the relative speed of the surface 27 past the feeder 24 will be decreased. The drive system 25 controls the operation of the feeder 24 so that the speed of supply of batch material onto the conveying surface 27 compensates for this difference in relative speeds and provides a uniform depth of batch material on the conveying surface 27.

In moving the feed system 11 along the rails 21 and 22 the speed of drive of the carriage 20 by the drive system 25 is varied as the carriage 20 travels along the rails so that the speed of movement is greater inbetween the rows of electrodes 18, 19 and 20 and is slowed down as the conveyor 26 is reciprocated over each of the row positions. A plurality of sensors 30 are located on the guide rail 21 at suitable positions relative to the rows of electrodes 18, 19 and 20 so that the carriage speed is varied on passing the positions of the sensors. The sensors may be in the form of blocks

magnetically attached to the rails or the blocks may be held by screws or bolts in locating holes in a strip attached to the rails. In either case the position of the sensors 30 may be selected to match the required speed variation positions during the reciprocation of the carriage relative to the position of the electrode rows 18, 19 and 20.

In the example shown in Figure 1 the carriage when moving from the left-hand side, moves at its slow rate until reaching sensor 30a. It then moves at its fast rate between sensors 30a and 30b. It returns to its slow rate between sensors 30b and 30c. It moves at its fast rate between sensors 30c and 30d and again moves at its slow rate between sensor 30d and sensor 30e. It will however be appreciated that the positions of the sensors may be adjusted depending on practical operation of the glass melting furnace so that the regions of slow movement of the carriage are located in those parts of the path of travel where experience indicates that hot spots with possible thinning of the blanket are likely to form. In this way more batch material is located in those regions avoiding the possibility of unwanted hot spots.

The invention is not restricted to the details of the foregoing example.

CLAIMS:

1. A feed system for feeding batch material to a melting zone of a glass melting tank having rows of submerged electrodes to heat the glass in the melting zone, which feed system comprises a mobile carriage arranged for reciprocating movement in a first direction across said rows of electrodes, a batch distributer mounted on said carriage for reciprocating movement relative to the carriage in a second direction across said first direction, said batch distributer having a discharge outlet for mounting above a melting zone of a tank whereby batch material may be discharged at a substantially constant rate over the surface of glass in the melting zone, and a drive system for reciprocating the carriage in said first direction and the batch distributer in said second direction, said drive system having a speed control arranged to drive said carriage at a variable speed in at least said first direction so as to slow the speed of movement adjacent each row of electrodes in said tank so as to deposit a greater quantity of batch material adjacent said electrodes.

2. A feed system according to claim 1 in which said mobile carriage is mounted on a guide track at a level above said glass melting tank, said track being provided with indicators at selected positions along its length to indicate sections of the track where slower speed of movement is required.

3. A feed system according to claim 1 or claim 2 in which the batch distributer comprises a feed unit mounted over a feed conveyor with a batch conveying surface driven in one direction along its length, said conveyor being reciprocated along its length by said drive system and having a discharge end from which batch material may fall onto the surface of the glass in the tank.

4. A feed system according to claim 3 in which the feed unit has a variable rate feed system responsive to the drive system for reciprocating the conveyor so as to vary the feed rate

onto the conveyor in dependence on the direction of reciprocation of the conveyor so as to provide a constant depth of batch material on said conveying surface.

5. A feed system according to claim 2 in which the position of said indicators on said guide track are adjustable to permit variation of the locations in the travel of said carriage where slower speed of movement of the carriage occurs.

6. A method of supplying batch material from a feed system onto a blanket of batch material in a cold top glass melting tank, which method comprises supplying batch material onto a horizontal conveyor, reciprocating movement of the conveyor in two perpendicular directions over a blanket of batch material in the tank, discharging batch material at a constant rate from one end of said conveyor onto the blanket and varying the speed of reciprocation of said conveyor in at least one of said directions whereby a greater quantity of batch material may be supplied to said blanket in selected positions during said reciprocating movement.

7. A feed system for feeding batch material to a melting zone of a glass melting tank having submerged electrodes to heat the glass in the melting zone, which feed system comprises a batch distributor device arranged to move relatively to the melting zone to discharge batch over the surface of glass in the melting zone and control means to control movement of the batch distributor device so as to deposit a greater quantity of batch material adjacent said electrodes than over other areas.

8. A feed system according to claim 7 in which said control means is arranged to control the speed of movement of the batch distributor device in predetermined directions.

9. A method of feeding batch material to a melting zone of a glass melting tank having submerged electrodes to heat the

glass in the melting zone comprising moving a batch distributor device relatively to the melting zone to discharge batch over the surface of glass in the melting zone and controlling movement of the batch distributor device so as to deposit a greater quantity of batch material adjacent said electrodes than over other areas.

10. A method according to claim 9 comprising controlling the speed of movement of the batch distributor device in predetermined directions.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

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(ii) Int Cl (Edition 5) C03B

Search Examiner
V V BAILEY WOOD

Databases (see over)
(i) UK Patent Office

(ii)

Date of Search
27 MAY 1993

Documents considered relevant following a search in respect of claims 1-10

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	WO 81/02007 (JOHNS-MANVILLE)	1

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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